PRECIPITAITON OF ELECTRONS AT MERCURY'S SURFACE FROM THE MAGNETOSPHERE. D. Schriver[1], P.M. Trávníček[2], D.L. Domingue[3], Jörn Helbert[4], [1]Department of Physics and Astronomy (University of California Los Angeles, 3860 Slichter Hall, Los Angeles, CA 90095-1567; dave@igpp.ucla.edu), [2]Space Sciences Laboratory, (University of California, Berkeley, CA, pavel@ssl.berkeley.edu), [3]Planetary Science Institute (1700 East Fort Lowell Road Suite 106, Tucson, AZ 85719-2395; domingue@psi.edu), [4]Institute for Planetary Research (DLR, Rutherfordstrasse 2, 12489 Berlin, Germany; joern.helbert@dlr.edu)

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Introduction: Observations by the MESSENGER spacecraft in orbit around Mercury from 2011 to 2015 have established that Mercury's magnetosphere hosts a quasi-trapped population of electrons with bulk energies of 1–10 keV centered about the magnetic equator. Although there are occasional observations of higher-energy (≥ 35 keV) electrons within the magnetosphere, there is no high-energy radiation belt present at Mercury similar to those at the other planets in our solar system with global magnetic fields, including Earth, Saturn, Jupiter, Uranus and Neptune. Observations from MESSENGER's X-Ray Spectrometer and simulations have also established that the 1–10 keV electron population around Mercury precipitates to the surface in an auroral-oval-type pattern with fluxes of ~10^9–10^{10} $cm^{-2}s^{-1}$.

Magnetospheric Modeling: Global kinetic simulations of Mercury's magnetosphere has been carried out using three dimensional hybrid simulations and particle trajectory tracing methods. These simulations have determined that the quasi-trapped electrons within Mercurys' magnetosphere are energized in Mercury's magnetotail via a combination non-adiabatic particle acceleration near magnetic reconnection regions and betatron/Fermi acceleration. The precipitation profile of electrons from the simulations is shown in Figure 1.

Consequences of Electron Precipitation: The precipitating 1–10 keV electrons can cause X-rays to be generated and emitted from the surface [1], and also can result in the ejection of sodium ions into the magnetosphere through the process of electron-stimulated desorption [2]. Long-term electron precipitation may result in space weathering of the surface regolith [3]. The results from the simulations and consequences will be discussed in detail.

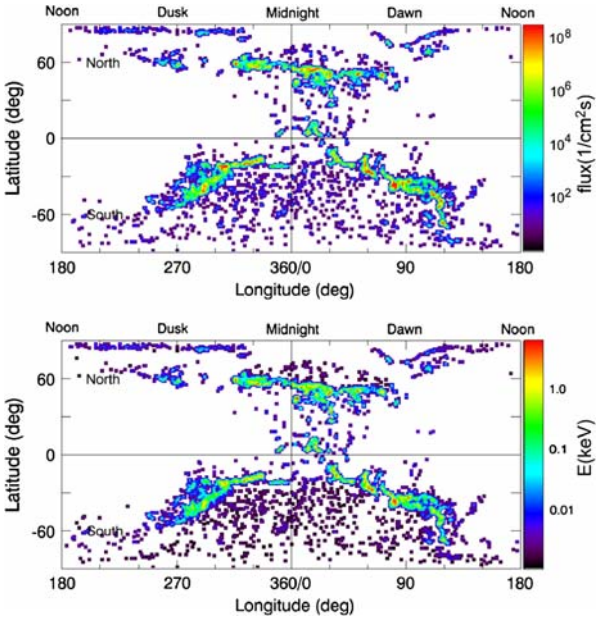

Fig. 1. Taken from Schriver et al. (2011) [2] and Domingue et al. (2014) [3], these graphs show the electron precipitation flux (top) and the electron precipitation energy (bottom) simulation correlating to MESSENGER's first flyby of Mercury. Longitude is a function of local time and not geographic longitude.

References: [1] Starr, R.D. et al. (2012), *J. Geophys. Res.*, 117, E00L02, doi:10.1029/2012JE004118 [2] Schriver et al. (2011) Planet. Space Sci. 59, 2026 [3] Domingue, D. L. et al. (2014) *Space Sci. Rev., 181,* 121-214